The psychological factors associated with poor compliance with treatment in asthma

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The psychological factors associated with poor compliance with treatment in asthma. C.M. Bosley, J.A. Fosbury, G.M. Cochrane. ©ERS Journals Ltd 1995.
ABSTRACT: Poor patient compliance with inhaled medication is known to cause morbidity and mortality in asthma. The reasons for nonadherence are not fully understood. We wondered whether psychological factors, such as patient attitudes to asthma and its treatment, anxiety, depression, and interpersonal problems, may be related to asthma self-care and compliance.

In a prospective study, 102 patients with asthma, aged 18–70 yrs, requiring treatment with regular inhaled corticosteroids and beta-agonists were recruited from a hospital out-patient clinic and four general practices in South East London. They underwent psychological assessment using the Hospital Anxiety and Depression Scale (HADS), the Inventory of Interpersonal Problems (IIP), and a semi-structured interview focusing on patient attitudes, self-care, compliance, social support and treatment beliefs. Patients were given terbutaline and budesonide turbohalers to use twice daily over 12 weeks. Turbohaler Inhalation Computers (TICs) recorded each inhalation, providing a measurement of compliance.

Seventy two patients completed the study. Thirty seven took less than 70% of the prescribed dose over the study period or omitted doses for 1 week and were defined as noncompliant. The noncompliant group had a higher mean (SD) score for depression (4.7 (3.3)) than the compliant group (3.2 (2.5)). The sample had a high mean (SD) score for anxiety (8.3 (4.4)), but there was no significant difference between the compliant and noncompliant groups. Patients' self-report and clinicians' impressions of compliance were not good predictors of actual compliance. Using discriminant analysis, a model was obtained from the questionnaires and interview items, which correctly classified 74% of the patients as compliant or noncompliant.

The study indicates that noncompliance is associated with a complex mix of psychosocial factors. Further investigation into these psychological factors and the possible usefulness of psychological intervention to improve compliance is suggested.
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For many asthmatics, taking a regular inhaled anti-inflammatory drug plus a bronchodilator provides effective control of symptoms. Despite the availability of treatment with few side-effects, noncompliance with inhaled medication is known to be a problem [1]. Studies by RAND *et al*. [2], MAWHINNEY *et al*. [3], and BOSLEY *et al.* [4] have shown that only a small proportion of patients regularly take medication as prescribed. Non-compliance in asthma is an important cause of morbidity [5] and mortality [6], and efforts must be made to understand why patients are choosing not to follow treatment advice.

The presence of psychological problems along with attitudes, feelings and beliefs about asthma and its treatment may affect patient behaviour. Those which adversely affect self-care, including compliance with treatment, should be identified and addressed so that morbidity due to asthma is reduced.

The aims of the study were, therefore: 1) to measure compliance with inhaled corticosteroid and beta-agonist treatment to identify a group of noncompliant patients; 2) to identify psychological problems among asthmatics (including anxiety, depression and interpersonal difficulties) and assess if they are related to noncompliance; and 3) to assess whether negative attitudes to asthma and its treatment (including relationships with health-care staff) are related to noncompliance.

Material and methods

Study subjects

Four general practices and a hospital out-patient clinic participated in the study. Patients with asthma between the ages of 18–70 yrs, who required treatment with regular inhaled corticosteroids and beta-agonists, were approached by letter and 102 patients were recruited.

Study design

As part of a study reported elsewhere [4], patients were randomly divided into two groups, one group receiving two turbohalers containing terbutaline and budesonide, respectively, and the others receiving one turbohaler containing a fixed combination of the two drugs. Each turbohaler contained terbutaline (250 mg·dose^{-1}) and/or budesonide (100 mg·dose^{-1}), and patients were told to take two or four doses daily from each inhaler for two 6 week periods. Patients were instructed in the use of the turbohaler (following a step-by-step checklist) by their general practitioner or practice nurse, and their technique was checked at the second visit. Lung function tests were performed at each of three clinic visits over the 12 week study. Each patient underwent psychological assessment using self-rating questionnaires and an interview (described below).

Measurement of compliance

Each turbohaler contained a Turbohaler Inhalation Computer (TIC). This is an electronic device which contains a microphone and real-time recorder. It identifies the sound of the turbohaler grip being turned by the patient, followed by the sound of an inhalation, and records the date and time of each valid inhalation in a memory chip which is later downloaded onto a personal computer (PC). The only outward difference to the turbohaler is that it is slighter longer (33 mm) and heavier than normal [7].

Assessment of compliance

The information downloaded from the TICs was used to obtain a measurement of compliance which was calculated as:

$$\% \text{ compliance} = \frac{\text{No. of doses taken}}{\text{No. of doses prescribed}} \times 100$$

Definition of noncompliance: those patients who took less than 70% of the prescribed dose over the study period or who omitted all doses for 1 week or more were defined as noncompliant.

Psychological measurements

It was thought likely that patients may wish to present themselves and their feelings about their asthma and its treatment in the most acceptable light if they were assessed by someone involved in their medical care. Therefore, the investigator carrying out the psychological assessments was not involved in the medical assessment or treatment of the patients' asthma, and was introduced as a counsellor, rather than a psychiatrist. Patients were asked to complete two self-rating questionnaires to return to the counsellor, and were then interviewed. The instruments used were:

The Hospital Anxiety and Depression Scale (HADS) [8]. This is a 14 item self-rating questionnaire designed to screen for anxiety and depression in patients with physical illness, it therefore excludes somatic symptoms of psychological disorder. It contains a depression subscale and an anxiety subscale scoring from 0–21, where a score of 8–10 is a borderline score and 11 or more indicates probable disorder.

The Inventory of Interpersonal Problems (IIP) [9]. This is a 127 item questionnaire which identifies problems with interpersonal relationships. Patients are asked to rate statements about relationship problems on a five point scale. The questionnaire contains six subscales; hard to be assertive (H. Assert); hard to be intimate (H. Intim); hard to be submissive (H. Submiss); hard to be sociable (H. Soc); too responsible (T. Resp); and too controlling (T. Control).

Semi-Structured Interview. In a semi-structured interview containing 28 items, patients were encouraged to talk about their lives in relation to their asthma. Demographic and other background details were recorded. The items covered: feelings of anger, shame, secrecy and denial; reports of past illness and past compliance with treatment; reports of self-care in general and in relation to asthma, including present compliance with inhalers; relationships with doctors and other clinic staff; support from family and partners; perceptions of treatment, its efficacy and drawbacks. Questions were phrased to permit the patients to give a negative or less socially acceptable answer. The interviewer discussed each item with the patients until they were satisfied that understanding had been reached. The item was then scored using bipolar visual analogue scale, according to strength of feeling, by the interviewer, the patient and by an observer who listened to a tape of the interview.

Patient consent and ethical approval

In order to obtain as accurate a picture of "normal" behaviour as possible, patients were not told that the TICs recorded their use of the turbohalers or that compliance was under scrutiny. They were aware that each turbohaler could count the number of doses given, as the appearance of the red marker on the turbohaler indicates that there are only 20 doses left. They were given full information on the nature of the drugs used and gave written consent for these and the psychological assessment. The full protocol received approval from the United Medical and Dental Schools (UMDS) Ethics Committee.

Statistical analysis

The demographic data of the two groups was compared using Chi-squared test. Analysis of variance (ANOVA) or nonparametric tests (Mann-Whitney U, Wilcoxon Rank Sum W test) were used to determine which of the demographic and psychological variables was significantly associated with compliance.

The semi-structured interview provided three measurements (one from each rater) for each item, and these were found to be highly correlated. Kendall coefficients of concordance were computed for each item. From this it was found that the patients' ratings differed in ranking from the observers' and interviewers' ratings. The observer and interviewer scores were averaged for each item to obtain a new set of variables.

Discriminant analysis was used to determine a rule of classification (compliant or noncompliant) using Fisher's linear discriminant function. A stepwise technique was used to select from a list of possible variables those which contribute to the discrimination.

Results

Patients

One hundred and two patients were recruited, (62 females and 40 males). Of these, 93 were interviewed and 87 returned the self-rating questionaires. By the end of the 12 week period, 72 patients remained in the study. Nineteen patients were lost to follow-up, the reasons for the withdrawal of the remaining 11 were: adverse event (4), lack of efficacy (3), erroneous inclusion (1), turbohaler damage/malfunction (2), other (1). The demographic details of the sample are given in table 1. Patients who were withdrawn had a younger mean (SD) age (39 (14)) than those who remained (45 (15) yrs) (p=0.03), but did not differ in any other way.

TIC malfunction

For the 72 patients who completed the study, 215 TICs were returned. Of these, 12 malfunctioned and were excluded from the analysis (as each patient was given two or four inhalers, one TIC did not represent one patient). Another 47 had recorded inhalations over an

Table 1. – Demographic details of the patient sample

	Compliant n=35	Non-compliant n=37	Lost to follow-up n=19
Age yrs*	47 (16)	43 (15)	36 (14)**
Sex M/F	16/19	12/25	9/10
SE group n			
1	1	1	1
2	4	0	1
3 NM & M	26	27	8
4	0	6	1
5	4	3	0
Time since diagnosis yrs	16.4 (14.6)	10.1 (12.4)	31.1 (11.7)*

*: data are presented as mean and SD in parenthesis. M: male; F: female; SE group: Socio-economic group; NM: nonmanual; M: manual; C: compliant; NC: Noncompliant; LFU: lost to follow-up; *, **: P=0.05, 0.03 respectively, t test.

initial period and then stopped. It was unclear in these cases whether patients had ceased to use the inhalers or the battery had failed, as many of the batteries had expired by the time they were returned to the research centre. For those TICs which showed a sudden stop in dose recording, the compliance level over the period prior to possible failure was calculated. At least 6 weeks of good recordings were available for 62 patients (86%). The compliance of the remaining 10 patients was calculated for the period over which a TIC was functioning, but this may have resulted in some degree of overestimation of compliance in these patients.

Compliance levels

Using the above definition, 37 (51%) of the patients who completed the study (n=72) were noncompliant. A striking finding was that the pattern of compliance with the corticosteroid was similar to that of the beta-agonist; there was no evidence that patients preferred the beta-agonist. Those patients who were noncompliant with one, were usually noncompliant with both. Compliance was not significantly different in the group using the turbohaler containing the combination of the two drugs, and there was no difference in the drop-out rates between the two groups. There was also no significant difference in compliance between the dose groups. Further details of the compliance figures and patterns of inhaler use are reported elsewhere [4].

Demographics

Age, gender and duration since diagnosis. The proportion of compliant patients increased with age and with duration since diagnosis, although the trend did not reach significance using Chi-squared test (p=0.06 and p=0.07, respectively). There was no significant difference between males and females, and there was no significant link between socioeconomic status and compliance (table 1).

Hospital Anxiety and Depression Scale. The mean (SD) score for anxiety was significantly higher for females (9.7 (4.6)) than males (6.2 (3.4)), (Mann-Whitney U - Wilcoxon Rank Sum W test; p<0.005). The group as a whole had a high mean (SD) score (8.3 (4.4)) which lies within the borderline score for probable anxiety disorder. There was no significant difference between the compliant (8.4 (4.9)) and noncompliant (8.1 (3.8)) patients.

There was a significant difference between the two groups on the depression subscale; the noncompliant group having a higher mean (SD) score (4.7 (3.3)) than the compliant group (3.2 (2.5)) (Mann-Whitney U - Wilcoxon Rank Sum W test; p<0.05). Of the original 87 patients who returned the HADS: seven scored over 10; four were subsequently lost to follow-up; and three were noncompliant (table 2).

Depression was also found to be linked to smoking, where smokers were found to have a higher mean (SD)

Table 2. – Hospital Anxiety and Depression Scale (HADS) scores and Inventory of Interpersonal Problems

	Compliant n=35	Noncompliant n=37	Lost to follow-up n=19	Statistical analysis
HADS Scores				
Anxiety				Chi-squared
<8	16	18	5	NS
8–10	8	11	2	
≥ 11	10	8	3	
Depression				Chi-squared
<8	33	27	5	p<0.05
8–10	1	7	2	
≥11	0	3	3	
IIP Scores				Mann-Whitney U-test
T. Responsible	1.37 (0.78)	1.16 (0.81)	1.46 (1.03)	NS
T. Controlling	0.71 (0.57)	0.73 (0.51)	0.71 (0.43)	NS
H. Assertive	1.33 (0.82)	1.33 (0.78)	1.26 (0.80)	NS
H. Submissive	1.00 (0.62)	1.13 (0.85)	1.29 (0.63)	NS
H. Intimate	0.68 (0.86)	0.83 (0.86)	0.78 (0.42)	NS
H. Sociable	1.26 (0.79)	1.07 (0.77)	1.41 (0.07)	NS
Total Average	1.09 (0.49)	1.04 (0.63)	1.15 (0.45)	NS

IIP scores are presented as mean and SD in parenthesis HADS scores, <8 no disorder; 8–10: borderline disorder; ≥11: probable disorder. H: hard to be; T: too; NS: not statistically significant.

score (5.1 (3.5)) than ex-smokers (3.2 (2.5)) and non-smokers (3.0 SD (2.0)) (p=0.02). The noncompliant group consistently had a higher mean score for depression within each smoking category, suggesting that there is an association between compliance and depression, and depression and smoking. Smoking alone was not significantly associated with compliance.

Inventory of Interpersonal Problems. The IIP assesses the presence of problems in personal relationships, giving an overall average score (the higher the score the more the patient is distressed by interpersonal problems) and also providing subscales which help to identify the nature of the problem more specifically. There were no significant differences between the compliant and noncompliant groups on the subscale scores or on the total average scores using the Mann Whitney U - Wilcoxon Rank Sum W test (table 2).

Semi-structured interview

Clinician impressions and patient self-report. Following the interview, the interviewer and the observer made a prediction of compliance based on the clinical impression of the patient. From this, 54% of patients were correctly identified as compliant or noncompliant, 38% of compliant patients were thought likely to be noncompliant, and 53% of noncompliant patients were thought likely to be compliant. The association between clinician impression and outcome compliance was more likely to be by chance (p=0.45). Patients' self-reports were also no better than chance at predicting outcome, with 42% of the compliant patients reporting that they do not always take their medication and 54% of the non-compliant group reporting that they are never unable to take it.

On the questionnaire items, a large proportion of patients (32%) scored positively for feeling ashamed or embarrassed and 31% for feeling angry about their asthma. The majority of patients (94%) gave a positive response for finding the treatment helpful, but 32% said they felt something was stopping them following it. From the original group of 93 patients interviewed, 20 (23%) reported specific concerns about the treatment (such as fear of side-effects, fears of becoming addicted) but they were no more likely to be noncompliant. There was no significant difference between the compliant and noncompliant groups on these items.

Items from the interview and the questionnaires were entered into discriminant analysis. A model was elucidated which correctly classified 74% of patients as compliant

Table 3. – Model obtained by discriminant analysis; classification of compliant *vs* non-compliant patients

Variables	Standardized coefficients
Usually follows doctor's advice (PR)	-0.53
Avoidance of self-care (IOR)	0.37
Usually follows doctor's advice (IOR)	0.85
Depression score	-0.86
Age	0.58
IIP Score	0.40

Eigen value = 0.25
Cannonical correlation = 0.45
Wilk's Lambda = 0.0797
Significance = 0.02
74% of cases correctly classified

PR: patients rating; IOR: interviewer/observer rating; IIP Inventory of Interpersonal Problems. These variables contribute to the model interactively, as indicated by the standardized coefficients.

Table 4. – Model obtained by discriminant analysis; classification of compliant *vs* loss to follow-up patients

Variables	Standardized coefficients
Denial (IOR)	-0.31
Usually follows doctor's advice (PR)	0.68
Age	0.33
Depression score	-0.94
IIP Score	0.28
Eigen value = 1.14	
Cannonical correlation = 0.73	
Wilk's Lambda = 0.47	
Significance = <0.0001	

For abbreviations see legend to table 3.

or noncompliant (Eigen value=0.2547, cannoical correlation=0.45, Wilk's Lambda=0.79, significance=0.02). The model contained six variables; depression score, age, total IIP score, and three items from the interview (attitude to doctor's advice (patient's rating); attitude to doctor's advice (interviewer's/observer's rating); and avoidance of self-care (interviewer's/observer's rating) (table 3).

Another discriminant analysis was performed on the compliant group *versus* the lost to follow-up group. The model obtained correctly classified 85% of the patients as compliant or lost to follow-up (Eigen value=1.14, Wilk's Lambda 0.47, cannonical correlation=0.73, significance <0.0001). There were five variables within the model; depression score, age, total IIP score and two items from the questionnaire: denial (interviewer's/observer's rating); and attitude to doctor's advice (patient's rating) (table 4).

Discussion

Research in other chronic diseases has shown that poor compliance is independent of factors such as age, sex, education or socioeconomic group [10]. The experience of symptoms does not improve the likelihood of good compliance and treatment side-effects do not decrease it [11]. Simple measures, such as simplifying the drug regimen and giving clear written instructions, are the first step in improving compliance but are not enough for a large number of patients.

The use of patient education to improve compliance and other outcome measures (such as morbidity) has been examined in a number of diseases including asthma. Studies such as that by HILTON *et al.* [12], which concentrate on imparting asthma information to patients, show that this in itself is not usually enough to improve self-management ability or asthma morbidity. Others have offered a more comprehensive package of care, incorporating information, individual and group support and intensive follow-up, and these have shown an encouraging improvement in various outcome measures, although the intervention groups have not consistently been shown to do better than the control groups. In the large study by BAILEY *et al.* [13] the intervention group showed an improvement in reported compliance and functional status. In the study by WILSON *et al.* [14], environmental control measures, metered-dose inhaler (MDI) techniques and reported symptoms improved. However, in both studies, both the intervention and the control groups decreased their number of hospital visits and there was no significant difference between the two.

MAYO *et al.* [15] offered patients tailor-made treatment plans, and the intervention group showed a significant decrease in hospital use over the controls. The intervention group in the study by RINGSBERG *et al.* [16] improved on well-being scores but both the intervention and the control group decreased hospital use, whilst only the control group significantly improved their spirometry. It would be reasonable to assume that change in morbidity is due to changes in patient behaviour, including adherence to medication and overall self-management, but no direct measurement of compliance with medication has been made in these studies to ascertain exactly what has been the process of change, and which part of the intervention package is responsible for change.

The study confirms that noncompliance, like all human behaviour results from a complex interaction of many different factors, and it seems likely that patient attitudes to their disease and its treatment may be an important influence in how they cope with their illness and make use of their treatment. As BLACKWELL and GUTMANN [17] point out in their article, there is no stereotype for a noncompliant patient. Previous writers have considered how attitudes may affect behaviour. For example, BARNES *et al.* [18] wrote in their review that underusage of steroids may occur due to an unjustified fear of steroids, whilst WORTH [19] and BREWIS [20] both wrote that overemphasis of the side-effects is a recognized risk factor in contributing to the death of some patients from asthma. OSMAN *et al.* [21] examined patient "dislikes", and reported that 21% of patients "disliked" their steroid medication and 31% disliked using daily medication. These dislikes were not related to behaviour in this study. However, the study by SIBBALD [22] showed that patient attitudes were only weakly associated with behaviour.

The patients who dropped out of the study were significantly younger, and more likely to score higher on the depression scale than the rest. Although this was a small group, this may indicate that drop-outs differ from patients who continue to attend (whether compliant or not). As in any clinical study, those who agree to take part in and then complete the study are, to some extent, a self-selected group. It is, nevertheless, important to examine those patients who continue to take part and attend a clinic, but do not follow the advice of the health professionals involved.

The HADS identified a high incidence of anxiety disorder in the sample. It is established that patients with chronic disease have a higher incidence of psychiatric disorder, and it has been reported that asthmatics in particular have higher prevalence of anxiety [23]. It was not a good discriminator between compliant and noncompliant patients. This may be because the general level of anxiety was too high, or because anxiety may have positive and negative effects on compliance behaviour [24].

For example, some degree of anxiety may allow a patient to respond appropriately to their symptoms or help motivate them to take regular medication to avoid an attack, whereas overwhelming anxiety may make the patient too fearful to act. The depression scale scores from the HADS show that there is a significant relationship between depression and compliance, and although only a small number of patients achieved "caseness" (scored 11 or over) they were all noncompliant. It may be hypothesized that this form of noncompliance may improve when the depression is treated.

The interviewers were no better than chance at predicting who would be noncompliant, and patients' own reports of their compliance gave equally poor guidance to the outcome. This confirms previous findings that clinicians find it very difficult to identify poor compliers [25]. Patients may feel obliged to give the socially acceptable answer to such questions, but as such a large proportion of compliant patients admitted to noncompliance it suggests that patients either find it hard to recognize or to remember their own patterns of behaviour. These findings emphasize that there is little room for certainty in this area, and when treatments fail, noncompliance should always be considered as a possible reason. In order to use medication and manage their asthma in the way that maximizes good control of their asthma, patients must have the information necessary from their health care worker.

Good communication skills, listening to the patient's needs and tailoring treatments to each individual is good clinical practice. After those basic requirements are met, there will still be some patients whose asthma is not effectively controlled. The model derived from the data was able to classify 74% of patients as compliant or noncompliant. This is not sufficient to be useful in a clinical setting but may indicate that psychosocial and inter- and intrapersonal factors are of importance in compliance behaviour. Efforts focusing only on behaviours and ignoring fundamental psychological processes may fail to provide stable results. The authors suggest that psychological factors are important in the management of asthma and that psychological interventions may be helpful for some patients who are noncompliant.

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